Upper Atmospheric Science and Climate Change

The upper atmosphere is the outer layer of the neutral atmosphere, in which, above about 100 km, the temperature increases with altitude primarily due to its absorption of the EUV output of the Sun. Hence, this region is also called the thermosphere and co-exists with the ionosphere. The density, composition, and dynamics of this region are highly responsive to variations in direct energy inputs from the Sun and, at high latitudes, to the magnetosphere as well. Changes in the neutral atmosphere scale height in the lower thermosphere can result in the premature de-orbiting of low-altitude satellite systems due to the drag of the atmosphere on the satellite.

Below the thermosphere, the mesosphere and stratosphere are found between 10-100 km. These regions are the crossroads between the radiation-dominated thermosphere and the troposphere, the region of the atmosphere below 10 km which supports life on our planet's surface. The stratosphere serves as a barrier to the rapid loss of life-essential volatiles such as water. Long-term changes associated with anthropomorphic changes in climate (e.g. global warming and/or ozone loss) may be first detectable as changes in the basic properties of these regions, such as those involving chemistry and transport.